

## Highlights

Vol. 1 No. 17

Jan. 12, 1958

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# Washington SCIENCE TRENDS

CONGRESSIONAL ROLE IN SCIENCE-ENGINEERING developments shows signs of increasing emphasis, with leaders openly complaining that the Eisenhower Administration has failed to exert "leadership" in such fields as ballistic missiles, space research, atomic power. This attitude is bound to bring repercussions as investigations and congressional appropriations hearings get underway on Capital Hill.

Congressional "anxiety" comes at a time when far-reaching changes and policy shifts are in the making, particularly in the Pentagon, and the Atomic Energy Commission. Many in Washington believe that further Russian achievements in the Space and Atomic field during 1959 will bring further pressure on Congress to "do something."

Here is a summary of some of the policy decisions now being made:

MISSILES: Air Force is hitting hard on a campaign to convince the Congress that long-range air-launched missiles, such as Bold Orion, must be stressed. There is some feeling in the Pentagon that this program must succeed if there is to be any future large-scale procurement of manned long-range aircraft. Air Force is going all-out to keep both the Atlas and the Titan ICBM's in its arsenal. Maj. Gen. Ben I. Funk, Commander of the Ballistic Missiles Center, states flatly "We have no intention of curtailing or cancelling the Titan program." Navy is expected to continue to shift and alter its missile programs, with continued stress on Polaris. Stress will also be placed on Subroc and possibly a Scandanavian system now under review for anti-submarine work. Army will shift more funds into its Pershing solid-fuel missile and into short-range, tactical missile systems.

AIRCRAFT: The big congressional struggle here will be over continued development of the Convair B-58 and the development of nuclear aircraft. Many Congressional experts are convinced that some sort of nuclear plane will be flown by the Russians this year. The Administration budget reportedly contains far less money than requested for this program.

SPACE: Reports are circulating in Washington that something more than \$800 million will be allocated in the new budget for space projects to be divided between the National Aeronautics and Space Agency and the Advanced Research Projects Agency in the Pentagon. A score of satellite launchings and Mars and Venus probes are expected. Congressional critics insist, however, that not enough is being done.

ATOMICS: The picture here has considerably brightened, chiefly because of more friendly relations between the powerful Joint Committee on Atomic Energy and AEC Chairman John McCone. Under plans now being drawn up the Government will concentrate more on laboratory and prototype construction.

## SPACE PROGRAMS

NEW SPACE LEGISLATION is most likely to follow the pattern stressed in a report just published by the House Committee on Astronautics and Space Exploration. One section of the Report is of interest to the missile-space industry and anyone connected with research and development for the Federal Government. These Congressional comments are worth watching for clues to forthcoming policies.

Here are highlights of this section of the Report:

\* Inventions cannot be scheduled in advance. Solutions to known problems can be sought by organized attack upon them, but frequently key discoveries providing solutions or shortcuts or entirely new possibilities show up with little or no warning in quite unlikely circumstances. Experience with attempts to put thermonuclear energy to peaceful use also shows that a solution may lie tantalizingly just outside our grasp, with no real measure of how soon success can be achieved. This means that (a) mere setting of a timetable and appropriating money will not automatically permit us to achieve certain important goals and; (b) programs must be flexible enough to take advantage of scientific breakthroughs when they occur, both as to direction of development and rate of expenditure.

\* Crash programs are the most expensive kind to undertake. Money cannot buy back all the time which has been lost by neglecting a foreseeable need. The appearance, refinement, and testing of technical ideas inevitably requires a certain time lapse. Even where lead times can be compressed to a degree by use of overtime, and by starting production activities while design is still in a state of flux, there results a cost in diversion of resources from other worthwhile projects. It also creates the chance of irrevocable commitment to faulty designs, undue waste later in attaining operational reliability, and a wear and tear on key individuals which reduces their long-run total contribution to national progress.

\* The early design study phase of research is relatively cheap in money but it may not be cheap in amount of time required. If certain deadlines are important to national security in years ahead, it is a blunder to save moderate amounts of money in the first years by neglecting the research phase, when no amount of money will buy back the time later.

\* To start and stop programs is the most expensive and dangerous way to undertake them. A program should maintain a certain momentum. Institutions, whether governmental, industrial, university, or private research, must be able to hire staffs and acquire equipment in the reasonably firm knowledge that a program once started will be seen through except for compelling reasons; and they must not be in the position of hoarding scarce technical personnel on a mere outside chance that they will acquire programs. In a nation where individuals count, the men on scientific and engineering teams must be given some semblance of security in their jobs and personal relations, some stability for their family arrangements, if they are to devote their wholehearted interests to a research and development project...

\* Complexity of many of these projects is growing so that their planning requires programming of efforts over a longer span of years. Such long-range planning involves reconciling our traditional practice of appropriating money year by year with the funding (subject to safeguards) of certain important projects over a number of years. In a sense, this is done when required in the fields of natural resources and public works. It should be possible in space exploration.

## Defense Department Engineering

Here, for reference purposes, is a summary of research support of the engineering sciences by the Department of Defense. The information was gathered by George D. Lukes, Executive Secretary, Defense Science Board:

\* Mechanics -- The objective of the research program in mechanics is the systematic advancement of engineering knowledge and principles bearing directly upon design criteria for the development of new weapons systems and components. Studies on the following are included in the present program: the dynamics of gases, liquids and solids; aerodynamic problems; problems involving structural design, strength of solids, hydromechanics, propulsion, heat and mass transfer, soil mechanics; and problems involving the development and synthesis of mechanisms. Extramural support runs about \$25 million yearly.

\* Materials -- The objective of the research program is the systematic advancement of knowledge on the fundamental properties and behavior of materials to provide the best possible selection for designers and fabricators of military weapons and equipment. The present program includes studies on metals, minerals, ceramics, elastomers, adhesives, transparent materials, organic structural materials, fibers and fibrous materials, insulating materials, and dielectric and magnetic materials. Support runs about \$27 million yearly.

\* Combustion -- the objective of the research program in the field of combustion is to gain an increased understanding of the total process of transforming the chemical energy of reactants into thermal and kinetic energy of reaction products, so the design of military propulsion devices can be put on an increasingly rational basis. The present program includes investigations of basic phenomena in selected areas of physics, chemistry, fluid mechanics, thermochemistry, and thermodynamics; and also fundamental investigations of processes that are interrelated combinations of these phenomena. Extramural support runs about \$6 million yearly.

\* Electronics -- The objective of the research program in electronics is to ensure maximum extension and acceleration of all of our senses for military purposes. The present program includes acoustics and underwater sound; antenna theory, electromagnetic propagation and reflection; communications, data handling, and information theory; electronic instrumentation and standards; electronic counter-measures; IFF theory; infrared; navigation; radar; electronic tubes, parts and semiconductors; and electron and ion plasma. Extramural support runs about \$43 yearly.

\* Geophysical Sciences -- The objective is advancement through systematic and exploratory research of those selected aspects which will increase the capability of the military to utilize, predict and control the natural environment. Included in the present program are meteorology, climatology, oceanography, marine geology, geochemistry, cartography, geodesy, geography, astronomy, astrophysics, magnetism and gravity studies. Extramural support runs about \$19 million yearly.



TRAPPED RADICAL STUDIES: Studies conducted for the U.S. Army have led to the design of several types of glass dewars said to be suitable for spectroscopic studies of free radicals trapped at low temperatures. The dewars are reported to be simple to construct, can be easily rotated and taken apart by means of ground joints, and are adaptable for specific applications in free radical work where metal containers have generally been used. The devices can be used in the investigation of the nature of chemical reactions through additional basic knowledge of the arrangement of atoms and molecules in solids, on the forces acting on them, on the motion of atoms, and on the reactions between atoms and molecules.

(Details on methods and equipment available free. Write Office of Technical Information, National Bureau of Standards, Wash. 25, D.C. for Summary Technical Report No. 2309.)

CAPACITOR RESEARCH: Studies for the U.S. Air Force performed at Emerson and Cuming, Inc., Canton, Mass., have demonstrated that capacitors "of considerable merit" can be achieved through the use of coated aluminum foil. The research was designed to show whether a loaded resinous system could be used as a suitable high dielectric constant material for a solid wound capacitor capable of performing at high temperatures under operational voltage for protracted periods. The high dielectric constant was said to result in a substantial volume reduction per given capacitance.

(Details available from OTS U.S. Department of Commerce. Write for PL151203. 05 pages. \$2.50.)

CHEMICAL RESEARCH: Studies at the U.S. Department of Agriculture research station have demonstrated that the chemical dalapon and its related compounds act to inhibit plant growth and create a "vitamin deficiency" in weeds. The findings are said to make possible the development of herbicides of greater specificity and efficiency.

(Details from U.S. Department of Agriculture, Information Office, Washington 25, D.C.)

Bottled Oxygen Research: Studies connected with the U.S. Air Force nuclear airplane project are designed to determine how nuclear radiation may affect the bottled oxygen supply of aircraft crews. Researchers hope to learn whether the oxygen will require heavy shielding, or whether it can safely be stored outside the shielded area designed to protect crew members. It is hoped that the studies will show whether any chemical or radiation hazard will be connected with the oxygen supplies.

(Details from Information Office, Battelle Memorial Institute, 505 King Avenue, Columbus 1, Ohio.)

BULK FUEL STORAGE: Studies for the U.S. Army Engineers have resulted in design of pre-fabricated storage tanks which can contain up to 50,000 barrels of ground or aviation gasoline and can be constructed quickly and cheaply under battlefield conditions. The tanks are actually earth pits covered with large synthetic rubber coated fabric sheets. Experiments were conducted with the use of a fuel gel and soil mixture to pave and seal a liquid petroleum reservoir.

(Details from Southwest Research Institute, 8500 Culebra Rd., San Antonio, 6, Tex.)

ELECTRICAL-RESISTIVITY SURVEYS: Studies by the U.S. Bureau of Mines and Geological Survey have demonstrated that electrical-resistivity techniques give accurate information on the presence of underground structural conditions with which ores are commonly associated. The method is said to apply to certain type of lead-zinc deposits. A new report concludes that use of this method "eliminates unnecessary drilling to areas or zones of low resistivity where the possibilities for discovering zinc and lead ore bodies are most favorable."

(Report Available -- See The Checklist)

TOPOGRAPHIC MAPS: Small-scale maps of areas in the United States originally prepared for the U.S. Army will now be available for general distribution. Each five-color map covers an area of about 7,000 square miles at a scale of 1:250,000.

(Index available free. Write Map Information Office, Geological Survey, Washington 25, D.C. Maps can be purchased at Survey Offices in Denver, Dallas, Salt Lake City, Los Angeles, San Francisco and Anchorage.)

RADAR PROTECTION: Anti-radar coatings are reported by the Manufacturing Chemists Association to be under development for the U.S. Air Force. The Association says that the chemical nature of the coatings is still secret. However, it is said that some radar-escaping equipment is composed of horsehair impregnated with carbon, or rubber bonded to ceramics and brass. The Air Force is also said to be giving "top consideration" to coatings based on photosensitive chemicals. It is believed that radar could not detect missiles using such a coating since electromagnetic energy, necessary for radar detection, would be converted to chemical energy.

OCTANE RATINGS: A Government survey just released shows that Octane ratings of gasolines sold at service stations throughout the U.S. have reached new highs. Average regular-price gasoline had a rating of 90.2, compared with 80.1 ten years ago. Premium gasoline averaged 98.4, compared with 86.1 and super-grade gasolines, not available ten years ago, averaged 101.4.

(Report available -- See The Checklist.)

WEATHER RESEARCH: Federal Aviation Agency has established a Weather Division to manage programs directed toward modernization of the national aviation weather system as required to satisfy the needs of the civil and military air traffic control system. The Division will handle development of equipment and facilities for meteorology, data handling and communications, as well as system development. Division will be headed by Newton A. Lieurance, formerly director of Aviation Weather Services for the U.S. Weather Bureau.

SCIENCE EDUCATION: U.S. Office of Education has established a new position of Chief, Science, Mathematics, and Foreign Language Section. Post will be filled by Herbert Andrew Smith, Professor of Education, University of Kansas. The section he will head is part of the Aid to State and Local Schools Branch.

### THE CHECKLIST

- ( ) Space Handbook, Astronautics And Its Applications; first mentioned in SCIENCE TRENDS last week, this volume will probably be hailed as the foremost non-technical exposition of space problems and potentials published to date. Prepared by the Rand Corp. 252 pages. Free. (Write Committee on Astronautics and Space Exploration, New House Office Building, Washington 25, D.C.)
- ( ) United States and Outer Space; a new Congressional report urging expanded efforts to meet the challenges and opportunities of the Space Age. Includes a chronology. 41 pages. Free (Write Committee on Astronautics and Space Exploration, New House Office Building, Washington 25, D.C.)
- ( ) The Next 10 Years in Space; a unique survey, soon to be published, of the expectations of responsible scientists and industrial leaders on the "possible" and "probable" events of the next decade. Free. (Write Committee on Astronautics and Space Exploration, New House Office Building, Washington 25, D.C.)
- ( ) Science Spending; a review of recent legislative and executive actions on the Federal Budget for Scientific Research and Development. 4 pages. Free. (Write Information Office, National Science Foundation, Washington 25, D.C. for Publication NSF-58-39.)
- ( ) Radiation Effects; a commentary by U.S. scientists on the Report of The United Nations Scientific Committee on the Effects of Atomic Radiation. The Commentary takes issue with the wording of some sections of the UN Report and urges further study of numerous problems. 5 pages. Free. (Write Information Office, National Academy of Sciences, Washington, 25, D.C.)
- ( ) Metals and Minerals - 1957; the first volume of a three volume yearbook covering domestic and international mineral industry activities for a wide range of commodities as well as developments in mining and metallurgical technology. Just published. 1,367 pages. \$3.50. (Write Superintendent of Documents, Government Printing Office, Washington 25, D.C.)
- ( ) Liquid Gases; a detailed examination of the feasibility of transporting liquid gases over appreciable distances through piping systems. Includes helium, hydrogen, nitrogen, oxygen, etc; 42 pages. 30 cents. (Write Superintendent of Documents, Government Printing Office, Washington 25, D.C. for National Bureau of Standards Circular 596.)
- ( ) Electrical Resistivity Surveys; an appraisal of such surveys in exploring certain types of lead-zinc deposits. Free. (Write Bureau of Mines, Publications-Distribution Section, 4800 Forbes Avenue, Pittsburgh 13, Pa. for Report of Investigations 5426.)
- ( ) Motor Gasolines; a Government survey showing increased octane ratings for gasolines sold at service stations. Free. (Write Bureau of Mines, Publication-Distribution Section, 4800 Forbes Avenue, Pittsburgh 13, Pa. for Petroleum Products Survey No. 8.)

